Correlation of strength and swim ergometer performance with maximal short course swimming

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Introduction

Minimising drag and maximising propulsive force are key factors in competitive swimming performance, with explosive strength also important for start and turns. Identifying factors that highly correlate with performance may help prioritise strength and conditioning practices. Therefore, our aim was to analyse correlations of several strength variables to 100m short-course swimming performance in adolescent swimmers.

Methods

Twenty competitive swimmers, 10 male (age: 15.6 ± 3.5 years; mass: 67.0 ± 15.9 Kg; height: 170.2 ± 10.1 cm) and 10 female (age: 16.0 ± 1.8 years; mass: 60.3 ± 4.1 Kg; height: 165.0 ± 6.4 cm) volunteered to take part in the investigation. Recent 100-m short-course personal best (PB) swim performances in freestyle (Free) (64.58 ± 5.10 s :mean +sd), backstroke (Back) (73.07 ± 7.06 s) breaststroke (Breast) (87.46 ± 7.70 s), butterfly (Fly) (74.67 ± 9.54 s) and individual medley (IM) (74.28 ± 5.31 s) were correlated with swimmers' explosive strength (countermovement vertical jump (CMJ) and broad jump), swimfast ergometer (Kayackpro, USA) arm and leg tests as well as pool kick testing. Spearman's rank order correlation analysis was used to assess correlations between variables and PB swim performances.

Results and Discussion

To improve swimmers training programmes it is useful to understand the correlation between power output in dryland and in-water exercises and actual swimming performance by specific strokes.

- **Very large correlations** were found with; 100m pool kick (96.94 ± 13.64 s) and both Free (rs = 0.75; p<0.001) and Back (rs = 0.74, p<0.001), and with CMJ (36 ± 11 cm) and Fly (rs = -0.75, p<0.001).
- Pool kick was also **largely correlated** with IM (rs = 0.68, p=0.001) and Fly (rs = 0.53, p<0.02).
- **Large correlations** (rs = -0.54 to -0.69, p<0.01) were found with CMJ and all other swim strokes,
- Broad jump (183 ± 26 cm) was **largely correlated** with all strokes (rs = -0.52 to -0.53, p<0.02) except Breast (rs = -0.38, p = 0.07).
- The 100m ergometer arm test (60.06 ± 17.89 s) was **largely correlated** with performance across all strokes (rs = 0.51 to 0.62, p<0.02);
- The ergometer leg test (80.37 ± 31.08 s) was **largely correlated** with Free performance (rs = 0.68, p=0.001), **moderated correlated** with Back, Fly and IM, (rs = 0.45 to 0.47, p<0.05) but insubstantial correlated to Breast.

Conclusions

- The current assessment has highlighted useful stroke specific correlations for 100m short-course swimming performance and the importance of power output for these adolescent swimmers.
- A limitation of the current study was only using a Freestyle kick on the ergometer,
- Future studies should employ a stroke specific kick on the ergometer which will more closely resemble the specificity of leg movement used to produce propulsion in the water.

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